SF_6 Uses: Non-electrical and Non-semiconductor

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Workshop on Stationary High GWP Early Action Items

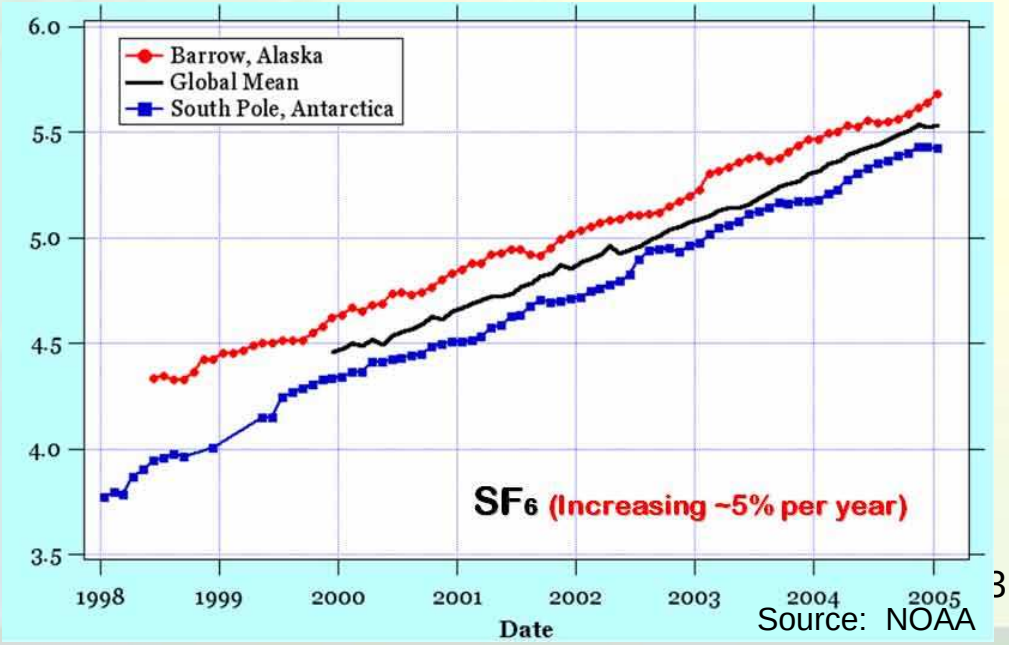
February 15, 2008

Outline

- Uses of SF_6
- Emissions and Trends
- Alternatives
- Existing Regulations
- Potential Reduction Strategies
- Costs
- Considerations and Outstanding Issues
- Working group formation
- Detailed timeline

Background

- Discrete Early Action
  - Regulation in place by 2010
- SF_6 has a very high global warming potential of 23,900
  - 1 lb of SF_6 = approximately 10 metric tonnes of CO_2
- SF_6 concentration (ppt) is increasing



Source: NOAA

SF_6 uses

- Semiconductors and electric utilities covered in separate measures

- Magnesium sand and die casting
  - 2 companies in CA
- Tracer Gas and Leak Testing
  - Fume Hood Testing
- Medical
  - Ultrasound, Retinal Eye Surgery, surgical-related organ inflation, X-ray equipment
- Other:
  - Shoes (phased out), soundproof windows & tires (not in US currently), tennis balls (unclear)
  - *Electronics, Photovoltaics – if sources identified within CA will be covered by semiconductor measure*
  - *Particle Accelerators – Coordination with Electric Utility early action*

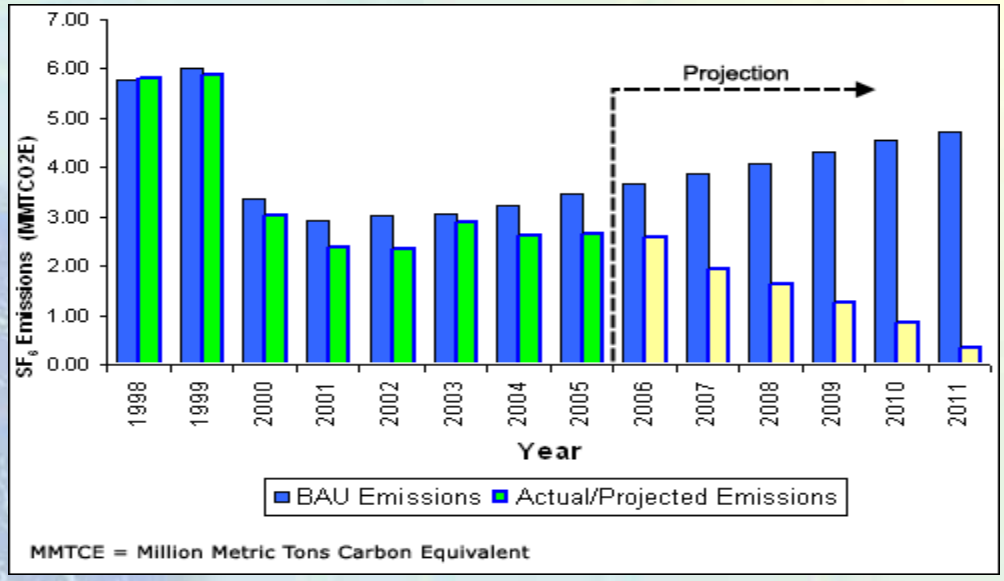
- Other sources may exist and we welcome input on other uses of SF_6
  - Request will be sent to manufacturers and distributors for information on usage amounts and types of applications

California Emissions

- Emissions currently not in CA inventory
- Mg = <0.1 $MMTCO_2E$ in 2004
  - Zero in 2020 due to voluntary reduction agreement
  - 2 California casters
- Other Uses = 0.1 – 0.9 $MMTCO_2E$
  - Mainly tracer and leak testing applications
  - Medical use has minimal leakage

SF_6 Emission Reduction Partnership

- EPA's SF_6 Emission Reduction Partnership & the International Magnesium Association committed to eliminate SF_6 emissions by year-end 2010
  - CA casters are partners and committed to goal



U.S. Magnesium Industry BAU vs. Actual/Projected Emissions (1998-2011)

Alternatives

- Magnesium sand and die casting
  - SO_2 and fluorinated ketone
- Tracer Gas (Includes Laboratory Fume Vent Hood Testing and other leak testing)
  - Alternatives need to have the following qualities: low toxicity, low combustability and corrosivity, long life, low background concentration, measureable at low concentrations
  - Alternatives are available – HCFC 123 (until 2015) and HFCs suggested by EPA
  - Alternative testing methods may be an option for fume vent hoods
- Medical
  - Ultrasound: Only one ultrasound uses SF_6 but improves contrast
  - Retinal Eye Surgery: Acts as tamponande to plug retinal hole; not quickly absorbed into blood
- Other:
  - Successful phase out in shoes in US and other uses in Europe support ban on non-essential uses

International Experience

- Denmark and Austria have used taxes and bans to reduce SF_6 use
- EU limits SF_6 in magnesium die-casting (above 850 kg/year) and banned in tires
  - Alternatives already available for these applications

Potential Options

- Ban all non-semiconductor and non- electric utility uses and imports of SF_6 in products
  - Include exemptions (e.g. medical uses)
    - Exemptions could be subject to limit on use (i.e. amount of SF_6 per study)
  - Time Frame for ban?
  - Links to Semiconductor and Electric Utility Regulations
    - Particle accelerator application similar to utility use (insulator)
    - If sources identified for etching for electronics (e.g. disk drives, LCDs) and Photovoltaics would be covered by semiconductor measure
    - Not to be covered by ban - will refer to those measures to ensure consistency
- Mitigation fee for unavoidable emissions

Costs

- Danish experience can act as upper bound
  - Combination tax/ban on HFCs and SF_6 cost ~$35/$MTCO_2E$
- EPA costs for Mg are low
  - $0.50-1.50/$MTCO_2E$
- For other sectors, currently identified alternatives are either similar in cost or less expensive

Considerations and Data Gaps

- Ensure viable alternatives
  - Evaluate effectiveness, toxicity, and life-cycle emissions
    - Toxicity and effectiveness evaluated by federal and state agencies and industry, will rely on current data
- Emissions of SF_6
  - Emission estimates are uncertain
  - Use of SF_6 may not result in emissions
  - Emissions in California may not rely on use in California (e.g. consumer products)
  - Survey being developed for SF_6 distributors

Working Group Formation

- Coordination with other agencies (Cal/OSHA)
- Stakeholders include: SF_6 manufacturers and distributors, tracer gas users (universities, laboratories, etc.), magnesium Industry, medical users, vent hood operators and regulators
- Meet at least twice
- First meeting in mid-March 2008 (tentatively March 19th)
- If interested, please provide your information

Schedule

February 2008	**Working Group Formation**
March 2008	**First WG meeting**
April 2008	**Public Workshop to discuss regulatory concepts**
May 2008	**Second WG meeting**
June 2008	**Public Workshop on proposed regulation**
September 2008	**Draft ISOR available**
November 2008	**Regulatory language and ISOR finalized**
January 2009	**Board meeting on action**

- Request will be sent to manufacturers and distributors for information on usage amounts and types of applications

Summary

- Comments and Suggestions are welcomed!
  - Please provide comments on presentation and concept paper by March 7th
- Contact Information:

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